



FEATURES

- 1600W output power (across the full DC input voltage range)
- 1.57"(1U) x 11.0" x 3.2"
- 93% typical efficiency at 50% FL
- 12VDC Main output
- 3.3VSB output (20W)
- 29W/in³ power density
- N+1 Redundancy Capable; hot plug/swap (up to 8 modules in parallel)
- Active current sharing on 12V main output; integral MOSFET ORING
- Over-Voltage, Over-Current; Over-Temperature Protection
- Internal variable speed cooling fans
- PMBus™ Power Management Bus
- RoHS Compliant

PRODUCT OVERVIEW

The D1U3CS-D-1600-12-HC4EC is a highly efficient 1600 watt, DC input front end module with a 12V main output and a choice of 3.3V (20W) standby and airflow direction. The power module is able to current share with up to eight (8) other power modules of the same type operating in parallel or N+1 redundancy.

The supplies may be hot plugged, and include integral isolation devices.

The power modules are fully protected from overload and overvoltage and are able to auto-recover from overtemperature faults. A Status LED is provided on the front panel and additional control and status reporting is provided by hardware logic signals and via a PMBus™ digital interface.

A low profile sub 1U height enclosure provides an excellent power density of 29W/in³ that is ideal for delivering reliable, efficient power to servers; workstations; storage systems and other 12V distributed power systems.

ORDERING GUIDE

| Model Number | Power Output | Main Output | Standby Output | Airflow |
|------------------------|--------------|-------------|----------------|---------------|
| D1U3CS-D-1600-12-HC4EC | 1600W | 12Vdc | 3.3Vdc | Back to Front |

INPUT CHARACTERISTICS

| Parameter | Conditions | Min | Typ | Max | Units |
|----------------------------------|---|-------|---------|-------|-------|
| DC Input Voltage Operating Range | | -40 | -48/-60 | -72 | |
| Turn-on Input Voltage | Ramp Up | -39.5 | -40 | -40.5 | Vdc |
| Turn-off Input Voltage | Ramp Down | -35.5 | -36 | -36.5 | |
| Maximum Current @ VIN = -48Vdc | 1600W | | | 40 | Adc |
| DC Input Inrush Peak Current | Cold start between 0 to 200ms | -40 | | 50 | Apk |
| | | -72 | | 100 | |
| Efficiency (-48Vdc) | 20% FL | | 92 | | % |
| | 50% FL | | 93 | | |
| | 100% FL | | 90 | | |
| Reverse polarity protection | Reversed input cables; no internal fuse failure | +40 | | +72 | Vdc |

OUTPUT VOLTAGE CHARACTERISTICS

| Output Voltage | Parameter | Conditions | Min | Typ | Max | Units |
|----------------|-------------------------------------|---|------|-----|--------|------------------|
| Main 12V | Voltage Set Point Accuracy | | | 12 | | Vdc |
| | Line & Load Regulation | | 11.4 | | 12.6 | |
| | Ripple & Noise ¹ | 20MHz Bandwidth | | | 120 | mV _{PP} |
| | Output Current | -40Vdc to -72Vdc DC Input Voltage Range | 0 | | 133A | A |
| | Load Capacitance | | | | 30,000 | μF |
| 3.3VSB | Voltage Set Point | | | 3.3 | | Vdc |
| | Line & Load Regulation | | 3.2 | | 3.4 | |
| | Ripple Voltage & Noise ¹ | 20MHz Bandwidth | | | 120 | mV _{PP} |
| | Output Current | -40Vdc to -72Vdc | 0 | | 6 | A |
| | Load Capacitance | | | | 10,000 | μF |

¹ Ripple and noise are measurements are to be performed with a parallel combination of a 0.1μF ceramic capacitor and 10μF tantalum capacitance on each of the power module output measurement nodes. A short coaxial cable from measurement point to 'scope shall be used.



Available now at
www.murata-ps.com/en/3d/acdc.html



| OUTPUT CHARACTERISTICS | | | | | |
|----------------------------|---|-------------------------------|------|-----|-------|
| Parameter | Conditions | Min | Typ | Max | Units |
| Remote Sense (Main Output) | Overall compensation at full load; +VE & -VE connections | | | 120 | mV |
| Output Rise (Monotonic) | 10% to 95% rise time | No positive voltage excursion | | | |
| Startup Time | DC Ramp Up | | 1.5 | 2.5 | s |
| | PS_ON activation | | 200 | | ms |
| Transient Response | 12V, 50%-100% or 100%-50% step load; 1A/μs slew rate | | ±600 | | mV |
| | 3.3SB 50-100% or 100%-50% step load 1A/μs slew rate | | ±165 | | |
| Current Sharing Accuracy | At 100% load (between sharing modules; up to 8 in parallel) | | | ±10 | % |
| Hot Swap Transients | | | | ±5 | % |
| Hold Up Time ² | FL (Full Load) | | | 1 | ms |

² Assumes deployment on systems with dual redundant "A" and "B" DC input feeds

| ENVIRONMENTAL CHARACTERISTICS | | | | | |
|--------------------------------|---|------|-----|-----------|---------|
| Parameter | Conditions | Min | Typ | Max | Units |
| Storage Temperature Range | Non-Condensing | -40 | | 70 | °C |
| Operating Temperature Range | 1600W Output Power | 0 | | 50 | |
| Operating Humidity | Non-Condensing | 5 | | 95 | % |
| Storage Humidity | | 5 | | 90 | |
| Altitude (no derating at 40°C) | | 3000 | | | m |
| Altitude (no derating at 50°C) | | 1800 | | | |
| Shock | Non-Operating | | | 30 | G |
| Sinusoidal Vibration | Operational, 0.5G; 5-500Hz | | | | |
| MTBF | Telcordia SR-332 M1C1 @ 40°C | | 395 | | K Hours |
| Safety Approvals (Standards) | CSA/CSA-C22.2 No.60950-1-07 2nd Ed, Amendment 1:2011 ANSI/UL Std. No. 60950-1-2011 IEC 60950-1:2005, (2nd Edition) + A1:2009 CE Marking per LVD DIRECTIVE 2006/95/EC | | | | |
| Input Fusing | Internal 60A/170Vdc fast blow fuse on the DC line input | | | | |
| Switching Frequency | 70KHz for the Boost Converter; 240KHz for the Main Output Converter | | | | |
| Material Flammability | UL94-V0 | | | | |
| Weight | | | | 2.84/1.31 | lbs/kg |

| PROTECTION CHARACTERISTICS | | | | | | |
|----------------------------|--------------|--|------|------|------|-------|
| Output | Parameter | Conditions | Min. | Typ. | Max. | Units |
| N/A | Over-Temp | Auto re-start | 57 | 60 | 63 | °C |
| 12V (Main) | Over-Voltage | Latching; toggle PS_ON or recycle DC input to reset | 13.3 | | 14.5 | V |
| | Over-Current | For slow overload events a constant current will be sustained for 1sec followed by a latch off that will auto reset in 5secs. For hard (short circuit) events the output will shut down within 50ms and auto restart within 200ms. This cycle will be repeated ten times at which point the output will permanently latch off. The power module will require to be reset by recycling the incoming DC source or "togglng" PS_ON. | 140 | | 160 | A |
| 3.3VSB | Over-Voltage | Latching; toggle PS_ON or recycle DC input to reset | 3.9 | | 4.3 | V |
| | Over-Current | Shutdown followed by auto-recovery | 6.5 | | 9.0 | A |

| ISOLATION CHARACTERISTICS | | | | | |
|---------------------------|----------------------------|------|------|------|-------|
| Parameter | Conditions | Min. | Typ. | Max. | Units |
| Isolation | Input to Output - Basic | 1000 | | | Vdc |
| | Output to Chassis (Ground) | 500 | | | Vdc |

| STATUS INDICATORS | |
|--|---------------------|
| Conditions | LED Status |
| No incoming DC supply present; power module completely unpowered (off). | LED not illuminated |
| Standby Rail ON; Main Output OFF; DC input present & correct | Blinking Green |
| Standby Rail ON; Main Output ON | Solid Green |
| Main Output overcurrent; undervoltage, overvoltage warning | Blinking Amber |
| FAN_FAULT; overtemperature; standby rail overcurrent, Main Output overcurrent or overvoltage | Solid Amber |

| EMISSIONS AND IMMUNITY | | |
|---|--------------------------------------|---|
| Characteristic | Standard | Compliance |
| Conducted Emissions | FCC 47 CFR Part 15; CSIPR 22/EN55022 | Class B |
| ESD Immunity | IEC/EN 61000-4-2; | Level 3; Criteria A |
| Radiated Field Immunity | IEC/EN 61000-4-3 | Level 3; Criteria B |
| Electrical Fast Transients/Burst Immunity | IEC/EN 61000-4-4 | Level 3; Criteria B |
| Surge Immunity | IEC/EN 61000-4-5 | Level 3; Criteria A |
| RF Conducted Immunity | IEC/EN 61000-4-6 | Level 3; Criteria A |
| Magnetic Field Immunity | IEC/EN 61000-4-8 | 3A/m; Criteria B |
| Voltage Dips & Interruptions | NEBS GR-1089-CORE Issue | Relevant sections and compliance levels TBD |

OUTPUT CONNECTOR & SIGNAL INTERFACE

DC Output and Signal Connector: FCI# 51731-057-LF

| | | | | | | | | | | | |
|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
| D1 | D2 | D3 | D4 | D5 | D6 | PB1 | PB2 | PB3 | PB4 | PB5 | PB6 |
| C1 | C2 | C3 | C4 | C5 | C6 | | | | | | |
| B1 | B2 | B3 | B4 | B5 | B6 | | | | | | |
| A1 | A2 | A3 | A4 | A5 | A6 | | | | | | |

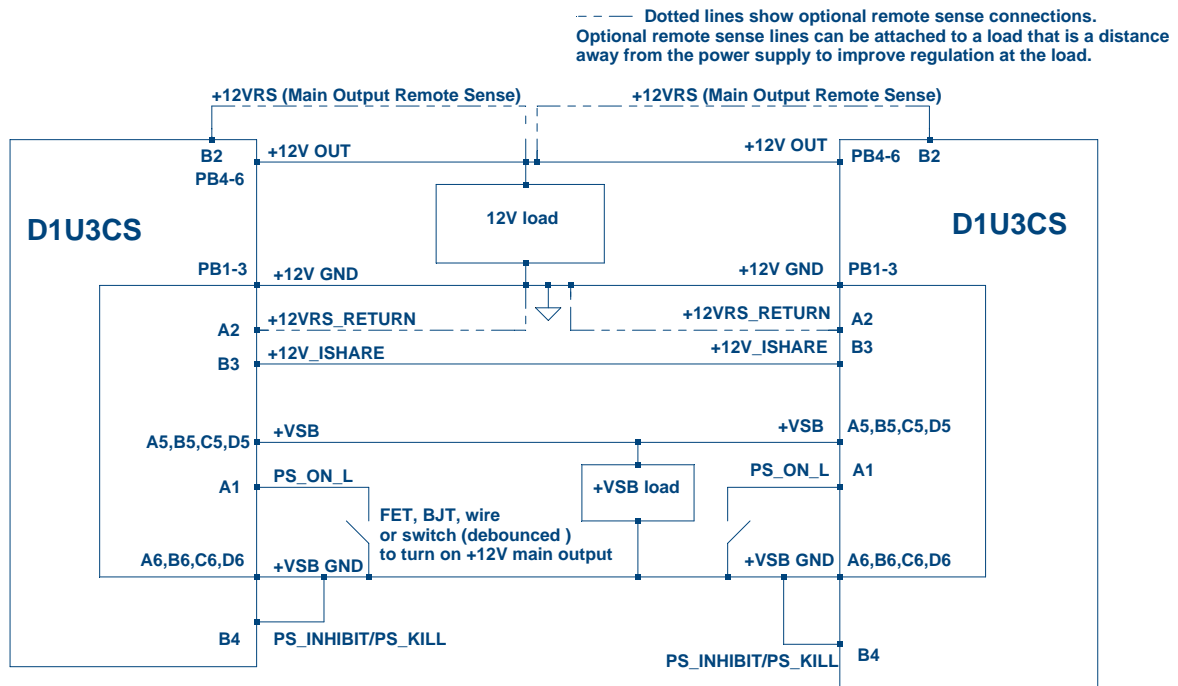
NB: B4 is the shortest "last make, first break" sequenced signal pin.

| Blade Assignment | Function | Description | Current (Amps per Pin) |
|-----------------------|------------------------|---|------------------------|
| PB1, PB2, PB3 | +12V GND | Main Output Voltage, Return | 30 |
| PB4, PB5, PB6 | +12V OUT | Main Output Voltage | 30 |
| Signal Pin Assignment | Signal Name | Description | |
| A1 | PS_ON_L | An input pulled up via an internal 10K ohm to the Standby rail. When pulled low (<0.7Vdc; via an open collector/drain drive or connection to GND) the Main Output will be turned on/enabled) | N/A |
| A2 | +12VRS_RETURN | Main Output Remote Sense (-VE/Return) | N/A |
| A3 | TEMP_OK | TTL compatible Logic HIGH provided when the temperature is within the allowable range of operation. | |
| A4 | PS_SEATED (PS_PRESENT) | Internally connected to GND within the power module; when correctly seated the corresponding mating connector pin is grounded and therefore allows detection that the power module is in situ. | N/A |
| A5, B5, C5, D5 | +VSB | Standby Voltage Output | 2.0 |
| A6, B6, C6, D6 | +VSB GND | Standby Voltage Output, Return/GND | 2.0 |
| B1 | DC_OK | A TTL Logic HIGH (>2.1Vdc) is provided to indicate the DC Input is present ("OK") and within operational limits. | N/A |
| B2 | +12VRS | Main 12V output remote sense line. | N/A |
| B3 | +12V_ISHARE | Main 12V output current share bus (see Current Sharing Notes). | N/A |
| B4 | PS_INHIBIT/PS_KILL | This is the shortest "last make, first break" (last to mate in the sequence). If left open circuit then the Main & Standby outputs will be inhibited (no output). When inserted in to the system slot this pin must be pulled "low" by the system to enable (turn on) the Main output and only after all other pins are connected and the power module is correctly seated. | N/A |
| C1 | SDA | I ² C Serial Data Line | N/A |
| C2 | SCL | I ² C Serial Clock Line | N/A |
| C3 | PWR_GD | Power Good signal. An active TTL HIGH signifies when the output is within regulation limits. | N/A |
| C4 | FAN_FAIL | Fan Fail signal (failure or locked rotor) | N/A |
| D1 | A0 | I ² C LSB (Least Significant Bit) Address Line | N/A |
| D2 | A1 | I ² C MSB (Most Significant Bit) Address Line | N/A |
| D3 | S_INT | System Interrupt; call for system attention to check power module status | N/A |
| D4 | N/C | No User Connection | N/A |

| MATING CONNECTOR | | | | |
|------------------|---------------------|------------------------|-----------------|--------------------|
| Supplier | Press Fit, Straight | Press Fit, Right Angle | Solder Straight | Solder Right Angle |
| FCI | --- | --- | --- | 51761-10002406ABLF |

| DC INPUT TERMINAL BLOCK | | |
|-------------------------|--|-------------|
| Supplier | Terminal Block | Part Number |
| Dinkle Enterprise | 2 Way Terminal Block; 40A rating; +VE & -VE DC Input cable connections | DT-7C-B14W |

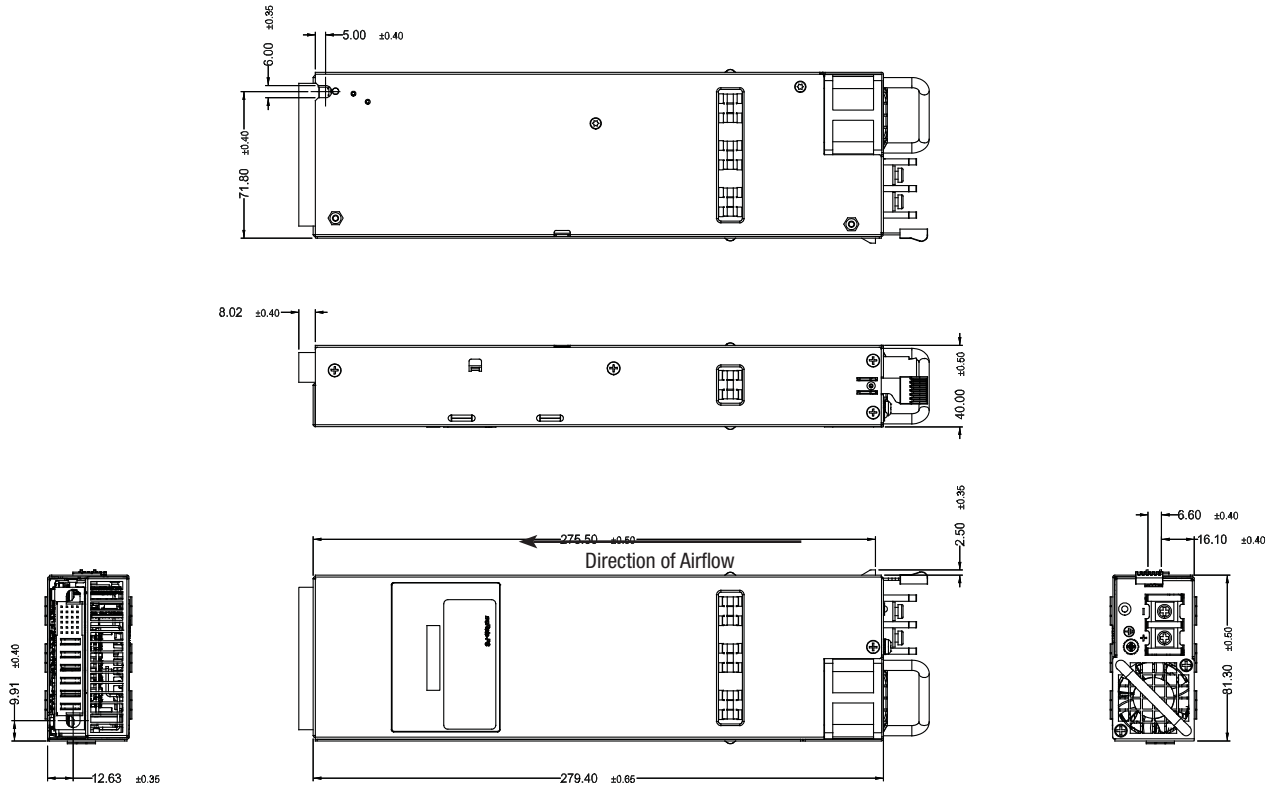
WIRING DIAGRAM FOR OUTPUT



CURRENT SHARING NOTES

1. Main 12VDC Output: Analogue active share bus. The ISHARE bus (Pin B3) must be connected on all sharing modules.
It is not required that the SENSE signals are connected to the remote load for current share to operate correctly.
2. Up to eight (8) power modules can be connected in parallel (non-redundant) or N+1 configuration. The current share bus is analogue bi-directional (can source or sink voltage representation of the current on the ISHARE bus).
The voltage of the bus would measure 8VDC for a single power module at 100% load; for two (2) modules sharing a common load the ISHARE bus voltage would be 4V for a perfect 50/50 current share scenario.
3. The VSTANDBY output of power modules can also be connected in parallel and have internal output isolation devices; however the combined available power is limited to that available from a single power module (3.3V; 20W) irrespective of the number of modules connected in parallel.

MECHANICAL DIMENSIONS



Notes

1. Dimensions: 3.20" x 11.00" x 1.57" (81.3mm x 279.4mm x 39.9mm)
2. Safety earth/ground connection via separate dedicated M4 pan head screw connection (located above terminal block)

OPTIONAL ACCESSORIES

| Description | Part Number |
|---|----------------|
| D1U3CS-12 Output Interface Connector Card | D1U3CS-12-CONC |

APPLICATION NOTES

| Document Number | Description | Link |
|-----------------|--|--|
| ACAN-41 | D1U3CS-12-CONC Output Interface Connector Card | www.murata-ps.com/data/apnotes/acan-41.pdf |
| ACAN-57 | D1U3CS-12 Communications Protocol | |

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 ISO 9001 and 14001 REGISTERED



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